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vet 360

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Striving Towards Wellness:
Grieving and Loss: The Painful Journey of Healing

Cardiorespiratory
Prevalence and Clinical Significance of Heart Murmurs Detected on Cardiac Auscultation in 856 Cats

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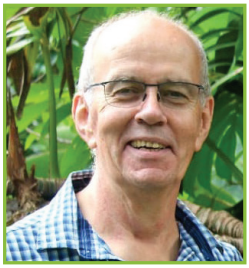

Hi everyone!
My first issue as editor, taking over from Liesel who did a sterling job for the past ten years! Hoping that the teething problems will not be too many – please feel free to let me know what you would like to see more (or less) of.

The series of wellness articles by Retha Watson concludes in this issue with discussion on grieving and loss – something we all experience at some level on a regular basis. Izak discusses the use of neutraceuticals in ophthalmology, alerting us all to false claims made by some distributors.

We look at the role of veterinary physiotherapists in cardiorespiratory disease – we often forget that they can make a huge contribution towards improved outcomes, and we all need to build close relationships with them. The overview on management of the osteoarthritic dog will help you to guide the owners in taking care of these patients. We have a look at urolithiasis; with clients having less disposable income available, many move away from the top-of-the-range pet foods and we might well see more uroliths in the years to come.

Our CPD article covers the significance of heart murmurs in cats. Enjoy reading and please drop me an email if you have a suggestion or comment!

Paul van Dam

vet360

VET360 aims to be a leader in the field of continuing veterinary development in Southern Africa by providing veterinary professionals from diverse disciplines with tools to help them meet the challenges of private practice. The magazine aims to make information accessible, both paper and electronic, and provide clinical, business and other veterinary information in a concise form to enable the practitioner to rapidly acquire nuggets of essential knowledge

Editor : **Paul van Dam** BVSc

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The Editor, PO Box 232, GROENKLOOF, 0027
Tel: (012) 346 1590, 082 575 6479. Fax: 086 671 9907
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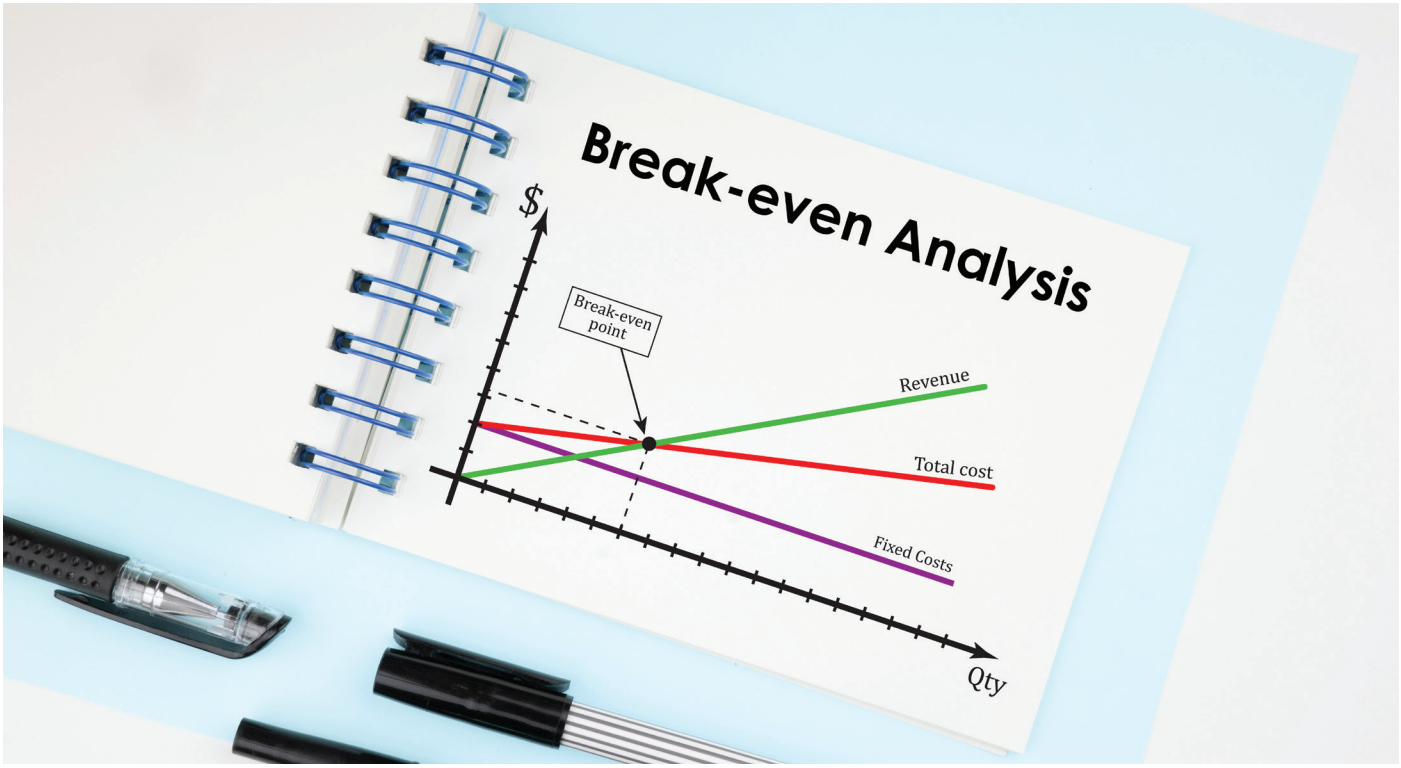

Breakeven Analysis in a Veterinary Practice

Andrew Christie
BComm (Business Management)
andrewc@acahr.com

Breakeven Analysis (BA) is a tool that should be used by businesses in general, and vet practices in particular, to assess issues such as the profitability of a new piece of equipment, changing the income streams, or even the economic viability of the business.

What is Breakeven Analysis (BA)?

Breakeven Analysis relates to the point at which revenue = expenditure, or Profit = 0. This is called the 'breakeven point'. This is significant, for example, when evaluating the sustainability of a practice. Assuming that the monthly breakeven level of revenue of the practice has been calculated at R1million, but only R900,000 is actually anticipated, then clearly there will be a shortfall of R100,000. The practice owner will need to assess whether the turnover can realistically be increased, whether this trend will change, etc.

What are the Components of BA?

While the concept of BA is straightforward, the components can be trickier:

Revenue – the income derived by a practice, procedure, machine, etc. For example, the total income derived from the operations of a practice is its revenue.

Variable Expense – the expenses that change or 'vary' with changes in revenue.
For example, if the revenue of the practice were to increase, it is reasonable to expect that more drugs and rubber gloves would be used and therefore the money spent on these items would increase.
Fixed Expenses – the expenses that do not change significantly with changes in revenue. For example, if revenue were to decrease, you can bet that the practice's landlord will NOT be reducing the amount paid as rent!

Breakeven Point of a Practice

Consider the simplified budgeted income statements below:

	A	B	C	D
Sales	100,000	200,000	50,000	75,000
Less: Cost of Sales	*60,000*	*120,000*	*30,000*	*45,000*
Gross Profit	40,000	80,000	20,000	30,000
Less: Overheads	*30,000*	*30,000*	*30,000*	*30,000*
Operating Profit	10,000	50,000	-10,000	0

If the practice generates R100,000 in a month, they can expect to pay R60,000 for Cost of Sales, which are the variable expenses.

They can also expect to pay R30,000 in overheads, which are the fixed expenses.

In Scenario B, sales are doubled and so the practice will have to pay double the Cost of Sales, while the fixed expenses will remain the same. This means that the operating profit will increase to R50,000.

In Scenario C, the sales are halved, so the cost of sales is also halved, while the overheads remain the same.

In Scenario D, the sales of R75,000 is equal to the variable expenses (R45,000) plus the fixed expenses (R30,000). In other words, at a sales level of R75,000, income will equal expenses.

As mentioned earlier, this is the Breakeven Point.

The Breakeven Point is calculated:

Overheads

Gross Profit ÷ Sales

So, in Scenario A above it is calculated:

$$\frac{\text{R30,000}}{\text{R40,000} \div \text{R100,000}}$$

$$= \frac{\text{R30,000}}{0.40}$$

$$= \text{R75,000}$$

So why is this significant for the owner of a practice? It enables the owner to start looking at the level of sales that must be achieved to cover expenses, rather than using sales as the basis on which expenses must be allocated.

One of the things that should be noted, for example, is in Scenario B where sales doubled, operating profit only went up R40,000. This is why, when my clients tell me they want to increase sales, I ask them if they can afford to – increasing sales will increase the cost of making those sales, too.

Now look at Scenario C where sales halved – a catastrophic event for any practice. But the practice only moved from a R10,000 profit to a R10,000 loss.

Yes, this is a problem, but it is not as severe as if one only looked at the drop in sales. So, while I'm not saying 'Don't increase sales' or 'go ahead and drop sales', BA gives us a more insightful measure of the business than simply looking at sales.

Breakeven Number of Clients

As practices focus more on consultations and procedures and less on the sale of products, knowing how many clients a practice should see each day / week / month / year becomes critical.

The lack of many Key Performance Indicators in South Africa leaves many vets avoiding the 'how many clients' or focusing on sales as a measure. As was shown in the previous section sales are an imperfect measure when it comes to profitability.

But calculating how many clients accurately is relatively straightforward. In fact, it's just about calculating three figures, then applying them to an equation.

- **Adjust Fixed Expenses.** The fixed expenses are obtained from the income statement. However, some expenses might need to be adjusted. The most common ones would be adding payments for fixed assets and deducting the depreciation (equipment, vehicles, property, etc. are on the balance sheet, but only their depreciation is included in the income statement) or adding the owner's dividends (these are not listed as fixed expenses but must still be included to calculate the breakeven number of clients).
- **Calculate Average Transaction Charge.** This is simply the total sales divided by the number of sales transactions. It can get complicated, because you should really take Merchandise and Food out of the calculation, as we should be looking at the average number of clients per procedure and these items skew the results. Similarly, you will need to deduct the number of clients that bought food and not 'services'. And what if the transaction includes...? As a starting point, use Sales divided by number of Sales!
- **Calculate Average Variable Cost of Transaction.** Simply divide Cost of Sales by the number of transactions. As with ii. above, it can get complicated. And, as with the above start simple!

EXAMPLE: Calculation of the Breakeven Number of Clients

	A		
Sales	100,000	Dividends paid	5,000
Less: Cost of Sales	*60,000*	Repayment of X-Ray machine	2,000
Gross Profit	40,000	Number of transactions	500
Less: Overheads	*30,000*		
Operating Profit	10,000		

Adjusted Overheads:
R30,000 + R5,000 dividends + R2,000 equipment repayment = R37,000

Average Transaction Charge:
R100,000 ÷ 500 transactions = R200 per transaction

Average variable Cost per Transaction:
R60,000 ÷ 500 transactions = R120 per transaction

Adjusted Overheads
Average Transaction Charge ÷ Average variable Cost per Transaction

$$= \frac{\text{R37,000}}{\text{R200 – R120}}$$

= **463 client transactions to break even**

Conclusion

BA shouldn't be based on figures older than a year, nor project into the future longer than a year. This is because trends change, sales levels change, prices change, etc. However, the ratio of variable expenses to revenue should remain similar over time.

ANDREW CHRISTIE (B.Comm)

BUSINESS MANAGEMENT
andrewc@acahr.com

Andrew Christie was born in Johannesburg and, after matriculating at St Johns College, he elected to plunge straight into the business world while completing his BComm in both Business Management and Industrial Psychology through the University of South Africa. He has worked at a bank and a training company and has partnered in a bookshop. But it is the past 10 years that he has spent consulting to veterinary businesses that he has found the most fulfilling. Andrew consults extensively on business issues to veterinary practices and other stakeholders within the veterinary profession, as well as conducting lectures on various aspects of business at Onderstepoort. His expertise with practice management in general and financial management in particular has made him a sought-after advisor on veterinary business issues, including practice valuations. He is the author of the forthcoming book, "Finance For Vets" businesses in South Africa.

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Striving Towards Wellness:
Grieving and Loss:
The Painful Journey of Healing

Retha Watson
(MA Industrial Psychology)

"Grief is a nasty game of feeling the weakest you have ever felt and morphing it into the strongest person you will need to become"

– Windgate Lane-

I remember losing my father. It has been twenty years, but the longing has never gone, and it will never go. The rawness, the deep and painful sadness after all these years has become a dull ache, one that I feel whenever I remember him or when I hear a song or experience another reminder of his life here on earth. I remember the shock of the loss of him as if it happened yesterday, even though I knew his time was near. When we lose someone, we will probably never be prepared for the sudden realisation that we will not hear his voice again.

In grieving the loss of a loved one or in grieving any loss, we tend to be our own worst enemy.

The second most debilitating thing we can do to ourselves is to try and move on, to get on with life, to move through

the grief as quickly as possible. To set a time for yourself to get over this. 'Life goes on' is a favourite saying.

The most debilitating thing is not to move through the grieving process at all, to get stuck in denial, believing that, if I move through, I may stop loving or missing, that I may forget if I move on, or that it will be a betrayal and disloyal if I move on. Most of us have experienced grief and loss in some form or the other. It could be the loss of a loved one, a parent, sibling, or a dear pet. What we tend to forget is that losing a living person from a relationship, resigning from a job, retirement, sudden loss of a limb or health or any other significant loss, also leads to grieving, and we should allow ourselves to grieve whatever we have lost.

Common Myths

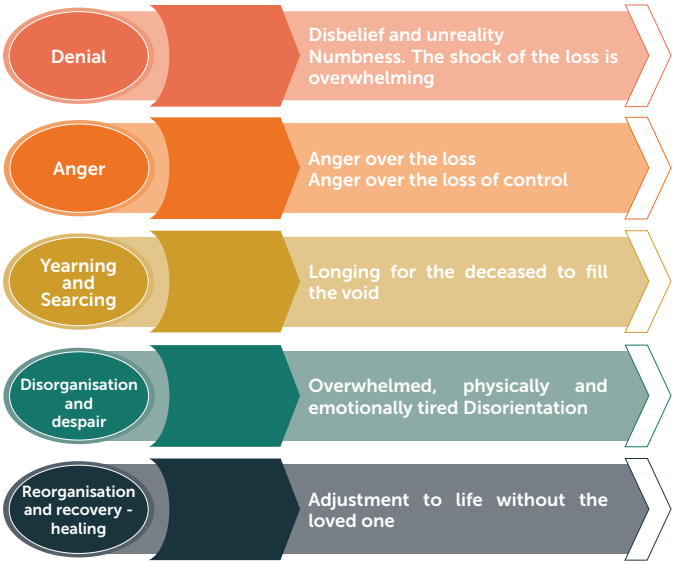
Common myths in the grieving process are:

- I have to be strong for others (no, you are entitled to your own grieving).
- The pain will go away faster if I ignore it (no, suppressing the pain will prolong the pain).
- It is important to demonstrate that I am strong (no, nobody expects us to be without emotion in the face of loss).
- Overt demonstration of loss means that the person is feeling the loss deeply and not coping well (no, each person deals with the loss and their emotions in their own way, allow space for individual grieving).
- Grieving has a time limit (no, there is none, each takes his or her own time to say goodbye).
- Moving on with your life means that the loss is forgotten (no, we should move on when we are ready).

Phases

The most well-known description of phases in grieving is that of Dr Elizabeth Kübler-Ross – denial, anger, bargaining, depression and acceptance, but there are several models on phases of grief. Another four-stage model is shock and numbness; yearning and searching; disorganisation and despair and reorganisation and recovery.

If I may be bold, I would blend the two models into:



Moving through the bereavement process does not mean we disregard memories, feelings or commitment. It simply means that you learn how to live without the loved one.

Timeframe

You probably would like to know how long it will take? This depends on many things:

- Your support system.
- The relationship and the dynamics of that relationship:
  - Do I have guilt over unresolved issues?
  - Was I dependent on the person for everything?
  - Do I have other relationships that make me happy?
- The circumstances of the death.

The correct answer is that there is no timeframe other than your own, being ready when you are ready. We move through grieving at different paces. We cannot compare the loss of a parent or child to the loss of a distant friend.

Process

There are specific tasks in the grieving process, in order to move on to the next phase. Unfortunately, we cannot skip any phase. Each phase is hard work, it is tough and difficult but so important.

Tasks in Grieving:

1. *Accept the reality of the Loss*
2. *Experience the pain or grief – do not be afraid to feel*
3. *Adjust to a life without the loved one*
4. *Find an enduring connection with the loved one whilst embarking on a new life*

What if we do not go through the phases?

We simply get stuck, and we cannot move forward or backwards. Literature shows that, like we live most of our life today, we want to rush through grieving, get the funeral done and dusted quickly, pack out the clothes and clear out everything, so that is out of the way.

We want cheap grief. The rush accomplishes the opposite of what is intended, it causes one to be stuck right there. The age-old rituals after death across all cultures are so important! We tend to let go of these for convenience, but these rituals were designed to help us in our grieving and loss. Be careful not to cheap the loss.

Other types of loss, such as retirement after a career, divorce, end of a friendship, loss of physical ability should receive similar rituals of saying goodbye to allow us to ultimately reorganise and adjust. It is important to remember that reorganising and adjusting does not mean acceptance, it does not mean that I am happy with the loss, it simply means that I have learnt to live around the pain. Some shy away from the emotions, avoid or numb these by using medication or a substance that dulls the pain. The emotions never go away, they will just present themselves in another form such as psychological or physical illness.

What normal reactions may I expect during a grieving process?

- **Physiologically:**
  - Sleep patterns are disrupted
  - Changes in stress hormones and health
  - Weakness
  - Trouble breathing
  - Restlessness
  - Immune system changes

- **Emotionally**
  - Strong feelings of sadness
  - Loneliness
  - Fear
  - Anxiety
  - Anger
  - Resentment
  - Guilt
  - Despair

- **Cognitively**
  - Trouble concentrating
  - Difficult to make decisions or solve problems
  - Forgetfulness
  - Changes to identity
  - Pessimism
  - Overthinking or avoidance of thinking about the loss
  - Fear of forgetting or losing memories
  - Seeing, smelling or hearing the loved one
  - Dreaming of the loved one
  - Blaming

- **Socially**
  - Social withdrawal
  - Isolation
  - Self-conscious
  - Emotional sensitivity
  - Outbursts of anger
  - Numbing the pain with substance abuse.

How do I cope with loss?

- Showing yourself kindness, do not be too hard on yourself. Own your loss! It is true that other people had it worse, but this may never diminish your own loss and grieving.
- Talk about the loss with others. Be careful, as this may turn into a "I know how you feel" moment and leave you more distraught than before. Take time to find professional support to walk the journey of your grief with you, a gentle hand that will support you.
- Do easy normal daily tasks that do not take a lot of energy or thinking power.
- Walking or jogging will also help with the anger and providing you with a space where you can freely think without interruptions.
- Allow time for grieving, allow yourself to feel that unbearable pain. It is okay to get a day when lying in bed is the only option, however the grieving process should not impact on your normal functioning, taking care of children and pets, going to work and buying food for the house.

Coping and continuing with daily tasks can be very robotic during the grieving process, but at least you are going through the motions.

- Understand that your grieving process is yours and unique to you.
- Support yourself psychologically by taking care of yourself physically.
- Recognise the difference between grief and depression.
- Accept that grief can trigger many unexpected emotions.
- Acknowledge your pain.
- Talk about the loved one, remember, we find support from those that have lost too.
- Avoid people that compare their loss to yours, the biggest insult is "I know how you feel".
- We tend to think that a person is coping well when they do not demonstrate emotions, but those that show emotions move through the grieving process faster than those that remain stoic.

Two of my colleagues lost loved ones recently. I know their journey ahead is long and hard, and I will offer silent support, a hug, a smile, a "I see you and I know your heart aches". Words we offer may be empty, but it is the just 'being there' that will make a difference.

NOTE FROM THE AUTHOR:

I started writing the articles as an initiative from the publishers to create awareness in the fraternity of veterinarians towards their psychological well-being; to prevent suicides and most importantly to keep living, your life matters. You matter to a lot of people.

Do not give up. Get the support you need and JUST DO NOT GIVE UP!

This was the last in a series of six articles and it was a tremendous honour for me to write from my heart and experience as a psychologist.

I enjoyed sharing and hoping that it helped someone. So, with the theme of this article, I am also saying goodbye.

Thank you for all the positive feedback, I hope that we are more aware of those around us, just be kind.

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Prevalence and Clinical Significance of Heart Murmurs Detected on Cardiac Auscultation in 856 Cats

Luca Ferasin[1,2],* Heidi Ferasin[1,2] Altin Cala[1,2] and Naomi Creelman[1]

1 Specialist Veterinary Cardiology Consultancy Ltd., Four Marks GU34 5AA, UK
2 The Ralph Veterinary Referral Centre, Marlow SL7 1YG, UK
* Correspondence: luca@cardiospecialist.co.uk

Introduction

In people, heart murmurs are the most common reason for referral to a cardiologist and, especially in children, approximately 50–70% of these murmurs are clinically insignificant.[1] Similarly, the discovery of a heart murmur is a common justification for referral in feline medicine and, based on our clinical case log, approximately 50% of all cats seen at our institutions are referred for further investigation of a heart murmur.

Another analogy with human cardiology is that many heart murmurs are detected in apparently healthy cats and cardiac disease is absent in as many as 50% of cats with heart murmurs.[2,3] However, many published studies on heart murmurs in cats have been primarily focusing on reporting the underlying structural abnormalities (e.g., cardiomyopathy, left ventricular hypertrophy, among others) rather than identifying the exact source of the blood flow turbulence,[2-7] although an attempt to report the correct aetiology of the murmur was reported in two of these studies.[2,6]

Therefore, the main aim of this retrospective study was to determine the prevalence of heart murmurs detected during routine clinical examination in cats, with a particular emphasis on obtaining the exact echocardiographic identification of the origin of the flow turbulence deemed responsible for those murmurs.

This study also sought to potentially identify patient and murmur characteristics that might predict a diagnosis of significant congenital or acquired cardiac disease.

We hypothesised that the majority of cats with a heart murmur detected on cardiac auscultation do not have an identifiable cardiac abnormality on echocardiographic examination as previously observed in other studies[2,3] and that some patient (age, breed, gender and body weight) and heart murmur characteristics (timing, intensity, PMI, dynamic or intermittent nature) may predict the presence of a structural cardiac abnormality.

Clinical records and echocardiographic examinations performed on cats between June 2009 and June 2022 for diagnostic investigation of a heart murmur at 2 institutions, namely Specialist Veterinary Cardiology Consultancy (SVCC Ltd., Four Marks, Hampshire, UK) and The Ralph Veterinary

Referral Centre (TRVRC Marlow, Buckinghamshire, UK), were reviewed retrospectively. The relevant information included examination date, cat's signalment, heart murmur characteristics, echocardiographic identification of blood flow turbulence (single or multiple) associated with the detected heart murmur, echocardiographic measurements, presence of structural abnormalities, electrocardiographic (ECG) findings and whether or not the cat underwent sedation prior to the echocardiographic examination. Cats were excluded from the study if they had incomplete clinical information, including the full description of the detected heart murmur or if the full native echocardiographic examination was not available for review.

Discussion

To the best of the authors' knowledge, this is the largest and most comprehensive study looking into the aetiology and clinical characteristics of heart murmurs in cats and, unlike most of the published research on feline heart murmurs, is the first attempt to systematically identify the precise origin of the blood flow turbulence responsible for these murmurs.

The median age of cats selected for this study was 5.6 years (range, 1 month– 19.5 years). The median body weight was 4.4 Kg (range, 0.3–12.4 Kg). There were 539 males (63.0%) and 317 females (37.0%), of which 463 were castrated males (54.1%) and 267 were spayed females (31.2%). Domestic shorthair (DSH) cats were the most represented breed in this study (60.5%), followed by domestic longhair (DLH) cats (6.8%) and British shorthair cats (6.1%).

The median age and body weight of cats referred to our clinics for cardiac investigation were very similar to other studies performed in cats referred to a cardiologist for further cardiac investigations.[2,6]

The majority of murmurs detected on auscultation were systolic (98.7%), with only a small percentage of diastolic (0.7%), continuous (0.5%) and to-and-fro murmurs (0.1%); the majority of cats displayed a soft (grade 1/6 or 2/6) murmur (56.7%), followed by moderate (grade 3/6) (28.7%), loud (grade 4/6) (12.6%) and palpable (grade 5/6 and 6/6) (2.1%) murmurs, while the point of maximal intensity (PMI) was described as sternal (or "both parasternal") in 38.3% of cases, followed by left parasternal (37.2%), right parasternal (21.7%), left base (2.0%) and left apex (0.8%), with no apparent association with the underlying heart murmur aetiology or the severity of the underlying heart condition.

This suggests that heart murmur characteristics in the majority of cats may have a limited diagnostic relevance, although loudest murmurs are more likely associated with a variety of severe congenital conditions (ventricular septal defect, patent ductus arteriosus, double-chambered right ventricle, pulmonic stenosis and mitral valve dysplasia), occurring either alone or in combination, as previously reported.[8]

The significance of intermittent heart murmurs may have different explanations. For example, these murmurs may be unmasked by an increased sympathetic tone due to stress or excitement, which ultimately increases heart rate, cardiac contractility, and blood pressure. Another possible explanation is the presence of inducible (iatrogenic) murmurs caused by overzealous chest compression with the stethoscope.[9] Similar phenomena can be hypothesised to explain the genesis of a dynamic heart murmur, with the only difference that dynamic murmurs are always audible, although they change in intensity during cardiac auscultation. Echocardiographic identification of the blood flow turbulence responsible for the detected heart murmur was obtained in 93.1% of cases.

In the remaining 6.9% of cases, echocardiographic examination failed to identify any significant turbulence or structural abnormality, which led to an echocardiographic diagnosis of flow (innocent) murmurs, adopting the same diagnostic criteria described in humans.[10,11]

The majority of cats that underwent full echocardiographic examination to identify the cause of a previously detected heart murmur did not present any structural cardiac abnormality (n = 485; 56.7%). These were mainly cases where the blood flow turbulence was associated with systolic anterior motion of the mitral valve (SAM) (50.3%), dynamic right ventricular outflow tract obstruction (DRVOTO) (19.9%) and flow murmurs (14.6%).

However, when these types of murmurs were analysed individually as a sole cause of murmur, 56.1% of cats with SAM and 85.0% of cats with DRVOTO did not display any structural cardiac abnormalities on echocardiographic examination. None of the cats with flow murmurs had structural abnormalities, by definition. Thus, unlike other studies where heart murmurs in cats appeared to be mostly associated with a cardiac disease,[2,3,5,7] these results seem to indicate that over half (56.7%) of heart murmurs in cats are not associated with any structural cardiac abnormality.

The remaining causes of heart murmur were attributed to either congenital defects (14.0%) or acquired cardiac conditions (29.3%), with a relative frequency depending on the underlying condition. Approximately one quarter of cats had multiple blood flow turbulences identified on echocardiography, which were deemed responsible for the murmur detected on auscultation.

This is, in our opinion, another important finding that reinforces the above observation that detection of heart murmurs in cats, in the absence of an echocardiographic examination, cannot provide sufficient information towards an etiological diagnosis, with the exception of intermittent heart murmurs inducible by chest compression and unmasked by varying the pressure of the stethoscope on the chest wall[9] or heart murmurs detected in young kittens, where loud murmurs are almost inevitably associated with a significant congenital defect (40.0% of cases) and

soft murmurs mostly consistent with a benign (innocent) condition (60.0% of cases). The most common origin of heart murmurs in these cats was dynamic left ventricular outflow obstruction associated with SAM, which represents approximately 40% of all murmurs detected in this feline population. Eighty percent of cats with hypertrophic cardiomyopathy (HCM)-phenotype and a heart murmur on auscultation had SAM.

Systolic anterior motion of the mitral valve was also present in other forms of cardiomyopathy, such as in 27.3% of restrictive cardiomyopathy (RCM)-phenotype, 33.3% of non-specific cardiomyopathy and 22.2% of end-stage HCM, based on the classification proposed by Luis Fuentes et al.[12], as well as in 24.2% of cats with mitral valve dysplasia. However, in 56.1% of all SAM cases, there was no echocardiographic evidence of structural heart disease, demonstrating that this form of dynamic left ventricular tract outflow obstruction is not pathognomonic of HCM, supporting the notion initially speculated, and subsequently confirmed, by Ferasin et al.[13,14]

The second most common cause of heart murmur in this feline population was represented by a DRVOTO, which was identified in approximately one third of cases. DRVOTO did not seem to be associated with any cardiac disease in 85.0% of cases, and since the echocardiographic abnormalities observed in the remaining 15.0% of cases did not appear to affect the right outflow tract, we believe that the presence of DRVOTO in such cases represents a pure incidental finding. Flow (Innocent) heart murmur represented the third most common cause of murmurs in this study (6.9%). However, it may be possible that the number of innocent murmurs was overestimated since a provocative manoeuvre was not performed in all echocardiographic examination to reveal the presence of inducible SAM or iatrogenic DRVOTO.[15]

It is also possible that the diagnosis of a heart murmur on auscultation was occasionally inaccurate, such as in case of rapid respiratory sounds coinciding with the heart beat and subsequently misinterpreted as a heart murmur.Blood flow turbulences associated with various congenital defects were considered responsible for an audible heart murmur in the remaining 21.9% of cases. However, it was impossible from our data to establish whether atrial septal defects (ASDs) were responsible for an audible heart murmur since they were always associated with other significant blood flow turbulences.The importance of this finding is particularly relevant for the clinical management of these cases, where an early diagnosis may change the clinical outcome by prompting corrective or palliative interventions (i.e., patent ductus arteriosus, pulmonic stenosis and aortic stenosis) or regular monitoring of the sleeping respiratory rate to allow early identification of clinical signs associated with congestive heart failure.[16,17]

Owing to the retrospective nature of this study, some data were missing in a number of patients, including blood pressure measurement, haematocrit and serum concentrations of thyroxine hormone, which may have had a potential impact on the genesis of the heart murmurs. Given the lack of data on systemic status of cats, it is not possible for the authors to conclusively exclude that, at least in some patients, the actual main or concurrent trigger of the murmur could have been misdiagnosed.

Another limitation was the inability to determine if outflow obstructions (namely SAM and DRVOTO) could have been potentially induced in some cases of "innocent" murmurs since provocative manoeuvres were not always performed, especially when these techniques were still unknown or poorly described. Furthermore, limited characterisation of the type of murmur for each echocardiographic abnormality may also represent a possible bias.

Another potential limitation is represented by the unknown effect of the various sedative protocols on the structural and functional echocardiographic findings. A relatively small percentage of cats – 73 cats (8.5%) – were sedated prior to their echocardiographic evaluation, either due to suboptimal patient compliance or because they were already sedated for other diagnostic procedures not necessarily related to their cardiac investigation. Similarly, information about the use of cardioactive drugs was missing in many cases, and therefore it was not possible to analyse their effect on the clinical and echocardiographic findings.

Finally, different clinicians were involved in the diagnosis and management of cats included in this study and this could have affected the accuracy of the results, although all clinical records and echocardiographic examinations were retrospectively reviewed by a board-certified cardiologist to double-check the accuracy of measurements and diagnoses.

Conclusions

More than half of cats referred for a cardiac evaluation of an audible heart murmur on thoracic auscultation do not have any echocardiographic evidence of heart disease, suggesting that most heart murmurs in cats are benign or may be potentially associated with a subclinical form of heart disease not detectable echocardiographically.

This study also demonstrates that some heart murmur characteristics (timing, intensity and location) can occasionally discriminate between normal cats and cats with underlying cardiac disease, with the exception of loud (mostly systolic) and palpable murmurs inevitably associated with a significant heart disease. However, since the majority of heart murmurs in cats appear to be systolic and mild-moderate in loudness, echocardiography, ideally performed by an experienced cardiologist, should always be considered following identification of a heart murmur on routine physical examination in cats, especially when they do not present any clinical signs referable to a heart disease.

EDITOR'S NOTE: *The content of the above article is based on the original article published in Veterinary Sciences. Full text is available at: Ferasin, L.; Ferasin, H.; Cala, A.; Creelman, N. Prevalence and Clinical Significance of Heart Murmurs Detected on Cardiac Auscultation in 856 Cats. Vet. Sci. 2022, 9, 564. https://doi.org/10.3390/vetsci9100564*

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1. What proportion of cats referred for heart murmur investigation in this study were found to have no structural cardiac abnormalities?
a. 25.3%
b. 39.2%
c. 50.0%
d. 56.7%
e. 63.5%

2. What was the most common cause of heart murmurs in this feline study?
a. Patent ductus arteriosus
b. Dynamic right ventricular outflow tract obstruction (DRVOTO)
c. Systolic anterior motion of the mitral valve (SAM)
d. Mitral valve dysplasia
e. Atrial septal defect

3. Which breed was most represented in this study?
a. British Shorthair
b. Persian
c. Domestic Longhair
d. Domestic Shorthair
e. Maine Coon

4. What percentage of murmurs in the study were systolic?
a. 90.1%
b. 93.5%
c. 98.7%
d. 99.3%
e. 100%

5. Which of the following statements is true about intermittent heart murmurs?
a. They are always a sign of congenital heart disease.
b. They may be induced by stress or excitement.
c. They are never associated with cardiac disease.
d. They only occur in young kittens.
e. They can only be detected with echocardiography.

6. What percentage of cats with DRVOTO had no structural heart disease?
a. 50%
b. 65%
c. 75%
d. 85%
e. 95%

7. According to the study, what should be done after identifying a heart murmur in a cat?
a. No further investigation is necessary if the cat appears healthy.
b. Immediate surgery should be performed.
c. An echocardiographic examination by an experienced cardiologist is recommended.
d. The cat should be given medication without further tests.
e. Only cats with palpable murmurs should undergo further testing.

8. Which of the following heart murmur characteristics is most likely to be associated with significant congenital heart disease?
a. Soft (grade 1/6 or 2/6) murmurs
b. Diastolic murmurs
c. Palpable (grade 5/6 or 6/6) murmurs
d. Right parasternal murmurs
e. Continuous murmurs

9. Why might some innocent murmurs have been overestimated in the study?
a. Not all cats had full bloodwork performed.
b. Provocative maneuvers to induce SAM or iatrogenic DRVOTO were not always performed.
c. Only young cats were included in the study.
d. Some murmurs were misdiagnosed as respiratory sounds.
e. Murmurs were only detected in sedated cats.

10. What is one of the key conclusions of the study?
a. All heart murmurs in cats indicate severe heart disease.
b. Most heart murmurs in cats are associated with mitral valve dysplasia.
c. The majority of heart murmurs in cats are systolic and mild to moderate in loudness.
d. Echocardiography is only necessary for loud heart murmurs.
e. A heart murmur alone is enough to diagnose heart disease in cats.

The Role of Veterinary Physiotherapy in Dogs with Cardiorespiratory Disorders

Natascha Hartmann, BSc Veterinary Physiotherapy
Equine-Librium College and Clinics

Introduction

Veterinary physiotherapy is a specialised field dedicated to the physical rehabilitation of animals. It enhances an animal's quality of life through a holistic, evidence-based, and non-invasive approach.

Veterinary physiotherapists help manage pain, improve mobility, and support long-term health. While veterinary physiotherapy is often associated with musculoskeletal and neurological conditions, it also plays a crucial role in supporting patients with cardiorespiratory dysfunction.

In South Africa, registered veterinary physiotherapists are permitted to perform cardiorespiratory evaluations and treatments under veterinary referral, as outlined in the Veterinary and Para-Veterinary Professions Act (SAVC Rules).

Cardiorespiratory Evaluation and Treatment in Veterinary Physiotherapy

- Veterinary physiotherapists can assess a patient's cardiorespiratory status using:
  - Auscultation of the heart and lungs
  - Calculation of heart and respiratory rates
  - Functional assessments of cardiorespiratory capacity
- Treatment, which must be performed under veterinary referral, includes but is not limited to:
  - Nebulisation (with medication prescribed by a veterinarian)
  - Manual respiratory techniques (percussion, vibration, and shaking)
  - Postural drainage positions

These interventions aim to improve respiratory function, facilitate mucus clearance, and enhance overall lung efficiency in affected patients.

Nebulisation in Veterinary Physiotherapy

Nebulisation is an essential pre-treatment technique that enhances the effectiveness of respiratory physiotherapy. Research indicates that **at least 10 minutes** of nebulisation increases the fluidity of airway secretions, improving mechanical clearance. Studies in human infants suggest that the primary benefit of nebulisation is hydrating airway secretions, regardless of the medication used. *In veterinary medicine, there is no strictly standardised nebulisation protocol, and different clinics follow their own in-house procedures.*

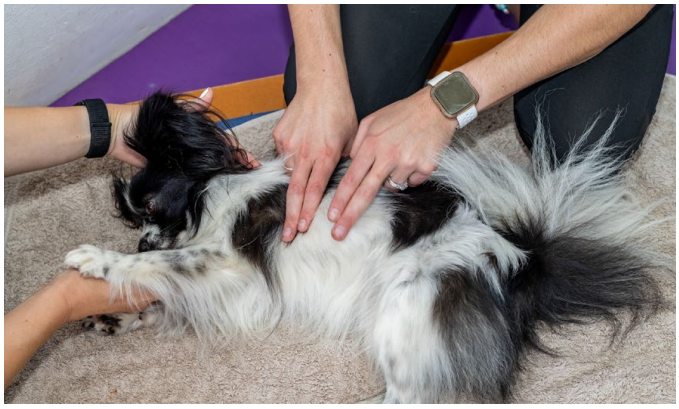
Once the veterinary physiotherapist determines that an adequate nebulisation period has been reached, manual respiratory techniques such as percussion and postural drainage commence immediately to optimise secretion clearance.

Manual Respiratory Techniques

Percussion (Coupage)

Percussion, or coupage, is a chest physiotherapy technique designed to loosen retained airway secretions and promote mucociliary clearance. The physiotherapist uses cupped hands to rhythmically pat the patient's chest wall, sending shock waves to the lungs that loosen mucus and facilitate its movement from smaller airways to larger airways for clearance via coughing.

- Typically performed for **30 seconds to 4 minutes** per session
- Followed immediately by **three to six expiratory vibrations** to further assist secretion movement



Vibration

Vibration involves applying gentle shaking and compression movements with open hands along the chest wall during expiration. This technique oscillates the chest wall, dislodging secretions and encouraging mucus clearance.

Shaking

Shaking is a more forceful technique than vibration, used to mobilise deeper lung secretions. It involves rhythmic chest wall movements, synchronised with the patient's breathing pattern to facilitate effective airway clearance.

Postural Drainage Techniques

Postural drainage utilises gravity to facilitate the removal of mucus from specific lung segments, preventing secretion pooling and improving lung function.

Benefits include:

- Enhanced drainage of peripheral lung areas
- Accelerated mucus clearance
- Increased functional residual capacity of the lungs

To be effective, each postural drainage position should be maintained **for 5-10 minutes per session**, with a

recommended frequency of **three to four sessions per day.** However, not all patients tolerate postural drainage, and adjustments may be necessary based on the dog's comfort and any concurrent conditions.

Additional Manual Techniques

Manual therapy targeting the intercostal muscles and costovertebral joints can significantly aid coughing efficiency, particularly in chronic cases where the intercostal muscles become fatigued, tight, and painful. This leads to less effective mucus clearance.

Physiotherapy techniques to address this include:

- Massage therapy (e.g., effleurage) for the intercostal muscles
- Dorsoventral and craniocaudal mobilisations of the costovertebral joints

Veterinary Physiotherapy Interventions in an ICU Setting

Recent studies have examined the effectiveness of chest physiotherapy in dogs admitted to ICU with respiratory distress, which appears to significantly improve gas exchange and reduces hypoxaemia within 48 hours.

This allows for a shorter duration of oxygen therapy and contributes to faster overall recovery.

- A typical protocol for dogs suffering from aspiration pneumonia in an ICU setting includes:
  - Oxygen supplementation
  - Appropriate pharmacological treatment
  - 10 minutes of nebulisation (using gentamicin, hypertonic saline, or isotonic saline, as prescribed by the referring veterinarian)
  - Immediate chest physiotherapy
- The chest physiotherapy session consists of airway clearance techniques, including:
  - Prolonged slow expiration (PSE)
  - Assisted cough (AC)
  - Note that treatment should only begin at least 1 hour after consuming a meal, in order to avoid regurgitation or vomiting.

Prolonged Slow Expiration (PSE)

PSE is a passive physiotherapy technique that does not require patient cooperation, making it well tolerated. The physiotherapist manually creates synchronised thoracic-abdominal movement by placing one hand on the thorax and the other on the abdomen, behind the diaphragm.

- PSE begins at the start of spontaneous expiration and continues until expiration is complete.
- The patient is positioned in lateral recumbency.
- The technique is repeated for 5 to 10 forced expirations, followed by a 5-cycle break of normal respiration.
- The process can be repeated for 5 minutes per side, with a 1-minute break in sternal recumbency before treating the opposite side.

Assisted Cough (AC)

If spontaneous coughing does not occur during forced expirations, assisted coughing can be induced by applying gentle tracheal compression at the end of the PSE session with the dog in sternal recumbency.

When Chest Physiotherapy Should Be Discontinued

In an ICU setting, cardiorespiratory physiotherapy should be stopped if a patient shows signs of:

- Increased respiratory distress
- Vomiting
- Discomfort
- SpO2 decreasing below 85% during treatment

Appropriate and Inappropriate Referral Patients

Which patients should general practitioners refer for cardiorespiratory veterinary physiotherapy?

- Suitable cases include:
  - Obstructive or restrictive pulmonary disease
  - ICU and cardiac patients
  - Dogs suffering from bacterial, viral or fungal pneumonia
  - Aspiration pneumonia caused by megaesophagus,

myasthenia gravis, laryngeal paralysis, or poisoning (e.g., tick bites, snake bites)
    - Upper respiratory tract obstruction (e.g., post-anaesthetic recovery in brachycephalic dogs
    - Pulmonary oedema from cardiac disease (left-sided heart failure)
- Contraindications and precautions include:
    - Cardiac arrhythmia
    - Pulmonary contusion
    - Chest trauma (e.g., rib fractures, pneumothorax, emphysema)
    - Thoracic tumours
    - Excessive haemoptysis
    - Clotting disorders
    - Haemodynamic instability
    - Traumatic myocarditis
    - Critically ill or injured patients

The Vital Role of Exercise

Exercise plays a crucial role in the rehabilitation of dogs with cardiorespiratory disorders, as prolonged immobility leads to a decline in physical conditioning. A structured exercise programme can aid recovery, particularly in the post-acute phase of pulmonary oedema and other cardiac conditions. Pre-exercise assessments, such as the six-minute walk test, help determine a suitable rehabilitation plan.

Programmes should include a warm-up, aerobic conditioning, and cool-down phase, tailored to the dog's lifestyle – active dogs require a higher intensity of rehabilitation compared to sedentary patients. To be effective, exercise must be carefully graded and performed at least twice per week, with a recommended minimum duration of eight weeks.

While research on exercise benefits in dogs with cardiac disease is limited, controlled cardio-focused exercise and weight management have shown superior effectiveness in maintaining lung health compared to other techniques.

Exercise stimulates deeper breathing, improves ventilation and expiratory flow, and has a neuromodulatory effect, reducing mucus viscosity and enhancing breathing rate and depth.

For non-ambulatory patients, assisted standing, passive range of motion (PROM), and positional changes should accompany every repositioning to maintain circulation, muscle function, and respiratory efficiency.

The Holistic Approach

In both chronic and acute cases of cardiorespiratory distress, it is essential for both the veterinarian and veterinary physiotherapist to consider the whole patient. Reduced mobility due to exercise intolerance or immobility affects the entire body.

Veterinary physiotherapists should adopt a holistic approach to maintain optimal health and quality of life, preventing joint stiffness and muscle atrophy through:

- Passive and active range of motion (PROM & AROM)

- Fascial release
- Muscular and neurological stimulation
- Mental stimulation

Educating owners on monitoring exercise tolerance, weight control, and concurrent health issues is crucial.

Conclusion

Veterinary physiotherapy plays a critical role in the management of cardiorespiratory disorders in dogs, providing essential interventions that improve respiratory function, enhance mobility, and support overall recovery.

Through techniques such as nebulisation, manual respiratory therapy, postural drainage, and structured exercise programmes, veterinary physiotherapists help optimise lung function and prevent complications associated with immobility.

A holistic approach that considers the entire patient, combined with owner education and ongoing veterinary collaboration, ensures the best possible outcomes. By integrating physiotherapy into the treatment of cardiorespiratory conditions, veterinary professionals can significantly enhance the quality of life and long-term health of their canine patients.

References available on request

Abstracts

1 The association between gonadectomy and timing of gonadectomy, and the risk of canine cranial cruciate ligament disease: A systematic review and meta-analysis

Daniel Low , Laura Costa, James Hawkesby , Ludovica Nardulli, Adelina Proteasa, Vasileios Vallios

Vet Surg. 2024 Dec 16. DOI: 10.1111/vsu.14197

Objective: To determine if gonadectomy in dogs is associated with the risk of cranial cruciate ligament disease (CrCLD) and to quantify the magnitude of the association.

Study design: Systematic review and meta-analysis.

Sample population: Comparative studies with gonadectomized and entire dogs, with CrCLD as an outcome measure.

Methods: A systematic search of the primary and gray literature was performed. The effect size of the outcome measure was defined as the odds ratios (OR) and 95% confidence intervals (CI). Subgroup analysis was performed with sex, breed, and age at gonadectomy. A pooled OR (95% CI) was generated from meta-analysis of relevant studies. Certainty in the body of evidence was rated with the Grading of Recommendations Assessment, Development and Evaluation (GRADE) framework.

Results: The literature search yielded 1398 results and 24 relevant studies were included for synthesis. Gonadectomized female (pooled OR = 2.293, 95% CI = 1.768-2.945) and male (pooled OR = 2.117, 95% CI = 1.665-2.691) dogs were both at increased odds of developing CrCLD in comparison with entire female and male dogs, respectively.

Subgroup analysis showed that gonadectomy at 1 year or less was consistently associated with an increase in odds of developing CrCLD in both sexes. Overall certainty in the evidence was rated as moderate. All included studies were observational and no controlled trials were available.

Conclusion: In data with moderate certainty, gonadectomy is associated with increased odds of developing CrCLD in both sexes, particularly in dogs gonadectomized at 1 year of age or less.

Clinical significance: This study provides an estimate of the true effect size of gonadectomy on the odds of developing CrCLD, which may be useful for clinical decision making surrounding gonadectomy and the timing of gonadectomy.

2 Total hip arthroplasty for femoral fractures other than capital physeal fractures in dogs: 14 cases (2012-2020)

T A Adams [1,2], S C Jones [1,3], J Dyce [1]

J Small Anim Pract 2024 Oct;65(10):759-769. DOI: 10.1111/jsap.13740

Objectives: The goals of this retrospective study were to assess the clinical and radiographic outcomes in dogs with proximal femoral fractures, other than capital physeal fractures, treated via total hip arthroplasty.

Materials and methods: Medical records as well as pre-operative, immediate post-operative and 2 to 3 months post-operative radiographs of 14 dogs with femoral head and neck fractures treated via total hip arthroplasty were reviewed. A Liverpool Osteoarthritis in Dogs questionnaire was completed by owners to assess long-term outcomes.

Results: Seven femoral head fractures, and seven femoral neck fractures were included. Four of the femoral head fractures were acute in nature, the three remaining femoral head fractures and all seven femoral neck fracture cases were chronic fractures. Malorientation of the femoral stem was more common in the chronic femoral fracture cases when compared to the acute femoral fracture cases.

Two of the acute fracture cases and five chronic fracture cases experienced a change in femoral stem position post-operatively. One femoral fissure fracture occurred and was repaired intraoperatively. One case had a post-operative complication that resulted in implant removal. All dogs had good to excellent owner-perceived outcome.

Clinical significance: Femoral head and neck fractures, and in particular the chronic cases, represented a challenging subset of cases presenting for total hip arthroplasty, resulting in suboptimal stem alignment in many cases. However, clinical outcomes were considered good to excellent in all dogs in the study, indicating that total hip arthroplasty is a viable treatment option for these types of fractures.

3 Effects of dietary cellulose on clinical and gut microbiota recovery in dogs with uncomplicated acute diarrhea: a randomized prospective clinical trial

Mara Holz, Julia Fritz, Jan S. Suchodolski, Melanie Werner, Stefan Unterer

JAVMA 2024 Nov;263(2) DOI: https://doi-org.uplib.idm.oclc.org/10.2460/javma.24.07.0476

Objective: To assess the impact of dietary fiber supplementation with cellulose on clinical course, fecal consistency, and intestinal microbiota composition in dogs with uncomplicated acute diarrhea (AD).

Methods: From September 2022 to November 2023, a total of 19 dogs presenting with uncomplicated AD were included in this prospective, randomized, and double-blinded clinical trial. The time to resolution of diarrhea was evaluated via owner surveys and a fecal scoring chart. The client-owned dogs were randomly assigned to a cellulose group (CG) or control group. The intestinal microbiota was analysed via quantitative PCR.

Results: A marginally significant, faster improvement in stool consistency on day 1 was observed in the CG (P = .09). All dogs improved clinically, with a median recovery time of 3.0 days in the CG and 3.2 days in the control group (range, 1 to 6 days in both groups). There was no significant difference regarding the Canine Acute Diarrhea Severity index or composition of the intestinal microbiota during the study.

Conclusions: All dogs with uncomplicated AD exhibited rapid clinical improvement and recovery of the core intestinal microbiota within the first few days. Cellulose improved the faecal consistency in a subset of dogs, and intestinal dysbiosis was mild and self-limiting.

Clinical Relevance: The administration of dietary cellulose has the potential to accelerate improvements of stool consistency. Mild changes in pathobionts, such as an increased amount of *Clostridium perfringens*, are self-limiting; thus, antibiotic intervention is not warranted.

4 Successful surgical management of aural hematoma with the application of polycaprolactone splint in 7 dogs and 3 cats

Yixing Xie,, Yintong Deng, Xiaying Teng, Heyu Li, Linghao Li, Dongxin Xv, Yizhou Chen

JAVMA 2025 Jan; Online Early DOI: https://doi-org.uplib.idm.oclc.org/10.2460/javma.24.09.0571

Objective: To report cases of aural hematoma (AH) in 7 dogs and 3 cats treated with polycaprolactone (PCL) splint application.

Animals: 7 dogs and 3 cats.

Clinical Presentation: 4 dogs and 2 cats presented with generalized AH, whereas 3 dogs and 1 cat presented with localized AH. All cases were investigated between December 2022 and June 2024. The hematoma area was measured to allow appropriate sizing of the PCL splint material. The surgery involved aspirating the hematoma and applying PCL splints to the auricle with sutures.

Results: The mean time of PCL splint application was 16.3 ± 4.6 days for all animals. Clinical signs were resolved in 5 dogs and 3 cats (8 of 10 AHs [80%]). Complications occurred in 3 cases. Two dogs (2 of 10 AHs [20%]) experienced recurrence at 7 and 10 days, which was suspected to be associated with the premature removal of the PCL splits: new PCL splints were applied to these dogs, and no recurrence of AH was observed upon their removal at 21 and 23 days.

One dog exhibited localised wrinkling of the auricle. There were no other cases of recurrent AH during the long-term follow-up period of >6 months.

Clinical relevance: The PCL splint application is safe and efficacious for treating AH in dogs and cats, whether localized or generalized, initial or recurrent. This simple surgical procedure minimizes iatrogenic skin trauma, and this approach may represent a valid alternative to other available treatments.

5 Gabapentin and alprazolam pretreatment enhance sedation and reduce propofol requirements but do not improve intravenous catheter placement in cats undergoing elective ovariohysterectomy

Virginia Papageorgiou, Charalampos Ververidis, Mathios E. Mylonakis, Ioannis Savvas, George Kazakos

JAVMA 2025 Jan; Online Early. DOI: https://doi-org.uplib.idm.oclc.org/10.2460/javma.24.09.0631

Objective: This study aimed to evaluate whether pre-treatment with gabapentin or alprazolam in cats increases sedation, facilitates intravenous catheter placement (IVCP), or reduces propofol requirements for intubation compared to placebo.

Methods: All cats that participated in this prospective, randomized, blinded, controlled clinical trial were admitted for elective ovariohysterectomy at a veterinary teaching hospital from 2022 to 2023. The cats were healthy, were ≥ 6 months old, and weighed > 3 kg. The cats were randomly assigned to 3 groups: group G received gabapentin

(100 mg/cat), group A received alprazolam (0.125 mg/cat), and group P received a placebo. Ninety minutes after the pretreatment administration, premedication with acepromazine (0.02 mg/kg) and buprenorphine (0.02 mg/kg) was administered intramuscularly.

Thirty minutes later, sedation levels, IVCP difficulty, and propofol requirements for intubation were evaluated.

Results: A total of 60 cats were finally included, with 20 cats in each group. Sedation scores were significantly higher in both group G and group A compared to group P, with no significant difference observed between group G and group A.

No differences were observed in the difficulty of IVCP among the groups. Propofol requirements for intubation were significantly lower in group A (4.6 ± 1.2 mg/kg) compared to both group G (6.7 ± 2.4 mg/kg) and group P (8.4 ± 1.9 mg/kg).

Conclusions: Pre-treatment with gabapentin or alprazolam increased sedation in cats undergoing premedication. Alprazolam reduced the propofol required for intubation, though neither drug facilitated IVCP.

Clinical Relevance: The findings of our study can have implications for anaesthesia protocols in feline patients.

Journal Scan

Effect of neutering timing in relation to puberty on health in the female dog – a scoping review

Summary

This summary from inFOCUS, RCVS Knowledge, Dec 2024
https://infocus.rcvsknowledge.org/effect-of-neutering-timing-in-relation-to-puberty-on-health-in-the-female-dog-a-scoping-review/

Moxon, R. et al. (2024) Effect of neutering timing in relation to puberty on health in the female dog–a scoping review. PLOS ONE, 19 (10), e0311779. https://doi.org/10.1371/journal.pone.0311779

The aim of this scoping review was to identify the current evidence on the effect of the timing of neutering in relation to puberty on five health outcomes: atopy, developmental orthopaedic disease (DOD), neoplasia, obesity and urogenital disease in female dogs, and to highlight any areas where there is a gap in knowledge.

Literature searches were carried out, following PRISMA-ScR guidelines, in May 2023 on three databases and a search for existing scoping and systematic reviews was carried out on four review databases in September 2023.

The identified studies were then assessed for inclusion based on population, exposures, intervention, outcomes, language and study design. Following this process, 33 articles remained for data extraction and review. Of these, one article examined atopy, 13 articles DOD, 11 articles neoplasia, six articles obesity, and 18 articles urogenital disease.

Dogs were grouped retrospectively into neuter groups based on age in 22/33 studies or by pubertal status at neutering in 5/33 studies, whilst two studies randomly allocated dogs to neutering age groups and two grouped dogs based on age when neutered.

The included studies reported thirteen different health outcomes to be significantly affected by timing of neutering under the five health categories investigated. No studies were identified that reported the impacts of neutering bitches before or after puberty on atopy, DOD or obesity. The majority of studies examined the effects on

health related to age, rather than pubertal status, at neutering. The study highlighted a lack of information on the timing of neutering in relation to puberty.

Take Home

This scoping review provides a clear overview of the current literature in this area. The review identifies that sufficient evidence to provide clear recommendations for veterinary surgeons and owners when making decisions about the timing of neutering female dogs relative to puberty does not yet exist. There is currently no available evidence on the impact of neutering before or after puberty on atopy, DOD or obesity.

The following may also be of interest:

inFOCUS: Benefits and risks of neutering pets – what is the evidence?
https://infocus.rcvsknowledge.org/brnp_benefits-and-risks-of-neutering-pets-what-is-the-evidence/

inFOCUS: Associations between neutering and early-onset urinary incontinence in UK bitches under primary veterinary care
https://infocus.rcvsknowledge.org/associations-between-neutering-and-early-onset-urinary-incontinence-in-uk-bitches-under-primary-veterinary-care/

inFOCUS: Assisting decision-making on age of neutering for 35 breeds of dogs: Associated joint disorders, cancers, and urinary incontinence
https://infocus.rcvsknowledge.org/assisting-decision-making-on-age-of-neutering-for-35-breeds-of-dogs-associated-joint-disorders-cancers-and-urinary-incontinence/

Perioperative anaesthetic complications in healthy cats undergoing anaesthesia for neutering in first opinion practice

Summary

This summary from inFOCUS, RCVS Knowledge, Dec 2024
https://infocus.rcvsknowledge.org/perioperative-anaesthetic-complications-in-healthy-cats-undergoing-anaesthesia-for-neutering-in-first-opinion-practice/

Brown, J.F. et al. (2024) Perioperative anaesthetic complications in healthy cats undergoing anaesthesia for neutering in first opinion practice. Journal of Feline Medicine and Surgery, 26(10).

The aim of this retrospective study was to investigate the prevalence of perioperative anaesthetic complications in healthy cats undergoing neutering in first opinion practice.

Anaesthetic records of cats attending three UK primary care veterinary practices for neutering were retrospectively reviewed. Data including signalment, ASA status, comorbidities, anaesthetic protocol and anaesthetic monitoring parameters, trap–neuter–return status, use of non-steroidal anti-inflammatory drugs, complications and any additional relevant events was extracted. A definition of complications was created based on a review of relevant literature; these were hypoxaemia, hypocapnia, hypercapnia, hypothermia, hyperthermia, bradycardia, tachycardia, hypotension and hypertension.

Data from 1,019 cases was included in the study, with similar numbers of male and female cats. Most cats (1,008) were classified as ASA grade I-II, and the majority of cats were domestic crossbreeds (875), and client owned (817). Comorbidities were recorded in 62 cats.

General anaesthesia was used in 1,015 cats, pre-anaesthetic medication of medetomidine/opioid combination was used in 925 cats, acepromazine/opioid in 55 cats, and a ketamine-based protocol in 33 cats. In this study the anaesthetic related mortality rate was 0.10% (one cat). Anaesthetic-related complications were observed in 544 cats, the most common complications were hypotension (22.6%), bradycardia (16.7%) and hypothermia (13.8%). Increased risk of hypotension was associated with pre-anaesthetic medication with acepromazine, higher maximum isoflurane dose, lower body weight and longer anaesthetic duration. Factors associated with increased risk of hypothermia were higher maximum isoflurane dose, increased anaesthetic duration and lower body weight, and those associated with increased risk of bradycardia were medetomidine pre-anaesthetic medication, longer anaesthetic duration and higher body weight.

Limitations of the study include the retrospective nature, missing data in the records, that there was no standardisation of pre-anaesthetic medications, and that not all variables were monitored in all the cats.

Take Home

This study provides evidence of the prevalence of anaesthetic complications in apparently healthy cats undergoing anaesthesia for neutering. The results drawn from a large population sample provide a useful benchmark for first opinion practices looking to audit or reduce anaesthetic complications in their own practice.

The following may also be of interest:

inFOCUS: *Reducing errors in veterinary practice – 5. Risk and error in veterinary practice: anaesthesia*
https://infocus.rcvsknowledge.org/revp-risk-and-error-in-veterinary-practice-anaesthesia/

Robertson, S.A. et al. (2018) *AAFP feline anesthesia guidelines*. Journal of Feline Medicine and Surgery, 20(7), pp. 602-634. https://doi.org/10.1177/1098612X18781391

inFOCUS: *Mortality related to general anaesthesia and sedation in dogs under UK primary veterinary care*
https://infocus.rcvsknowledge.org/mortality-related-to-general-anaesthesia-and-sedation-in-dogs-under-uk-primary-veterinary-care/

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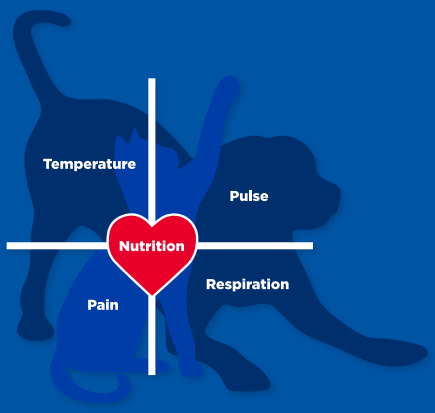

SCIENCE DID THAT.

Is there a Place for Nutraceuticals in Veterinary Ophthalmology?

Dr Izak Venter
BVSc, MMedVet (Ophthal)
Digital Veterinary Ophthalmology Services
www.dvos.co.za
Facebook DVOS VETS

The food supplement and nutraceutical industry is rapidly expanding. These products, concentrated forms of nutrients or bioactive food compounds, are used in both human and veterinary medicine, including ophthalmology.

While they show promise for conditions like retinal degeneration, slowing down cataract progression and feline herpesvirus, misleading 'miracle cure' claims can create skepticism among professionals. This review aims to clarify legitimate uses and address false marketing."

Nutraceuticals and supplements in ophthalmology: False claims

A common misleading claim is that L-carnitine cures canine cataracts. While a study showed N-acetyl carnosine may slow cataract progression, companies falsely advertise complete reversal, especially of mature cataracts. This misinterpretation undermines legitimate uses of such antioxidants in slowing, but not reversing, cataract development.

Before and After

Figure 1. Images available in online stores claiming positive results with the use of 'cataract eyedrops' (Amazon, 2024). Note the after photos are not the same patients as the before photos.

While they show promise for conditions like retinal degeneration, slowing down cataract progression and feline herpesvirus, misleading 'miracle cure' claims can create scepticism among professionals. This review aims to clarify legitimate uses and address false marketing.

Nutraceuticals and supplements with positive ocular effects

This article is not a comprehensive review of every substance that benefits ocular health. Instead, it will focus on the most commonly commercially available products with proven eye-related improvements. Their effects and potential applications for treating three specific conditions (feline herpesvirus-associated disease, cataracts and retinal degeneration) will be explored.

Nutraceuticals and supplements with antiviral effects

Curcumin

Turmeric (*Curcuma longa*), and its active compound curcumin, exhibits significant antiviral properties, particularly against herpesviruses. It's antiviral activity manifests through several mechanisms:

- Viral Replication Inhibition: Curcumin disrupts key cellular mechanisms necessary for herpes simplex virus (HSV) gene expression and replication. Specifically, it suppresses immediate-early gene expression in HSV-1 and interferes with HSV-2 replication by modulating the NF-kB transcription factor.
- Enhanced Antiviral Drug Efficacy: Curcumin may enhance the effectiveness of nucleoside analogue antiviral drugs, such as acyclovir. These drugs require the viral enzyme thymidine kinase (TK) for initial activation. Curcumin's potential synergistic action could improve the overall therapeutic outcome of HSV infections.
- Inflammatory Response Modulation: HSV infections induce inflammatory cascades. Curcumin's anti-inflammatory properties help temper this response by reducing the production of pro-inflammatory cytokines, including tumor necrosis factor-alpha (TNF-α), interleukin-1ß (IL-1ß), and interleukin-6 (IL-6), while also regulating the NF-kB transcription factor.

Lysine

Lysine, an amino acid explored for its antiviral potential against feline herpesvirus (FHV-1), presents a complex picture. While its proposed mechanism involves competing with arginine, essential for FHV-1 replication, research outcomes are inconsistent. Studies have reported varying results, from reduced conjunctivitis severity and viral shedding to a lack of significant therapeutic effect. Notably, some studies have concluded lysine does not inhibit FHV-1 replication, prevent infection, or improve clinical signs, and have questioned the safety of the proposed mechanism.

Despite these conflicting findings, anecdotal reports and ongoing clinical use suggest potential benefits, leading to its continued prescription by some veterinary ophthalmologists. However, it's crucial to acknowledge the limited scope of this summary and the need for more comprehensive research to definitively establish lysine's role in FHV-1 management.

ß-Glucan

ß-Glucans, glucose polymers derived from various sources like fungi and plants, exhibit unique immunomodulatory properties. Following oral ingestion, their acid resistance allows them to reach the intestines intact. Here, macrophages recognise and bind ß-glucans via specific receptors, triggering macrophage activation and migration to Peyer's patches. This process enhances antigen presentation and overall immune function.

Research suggests ß-glucans possess diverse biological activities, including antiviral, antitumor, and wound-healing effects. Notably, they demonstrate broad-spectrum antiviral activity, including documented efficacy against herpes simplex virus type 1 (HSV-1). In vitro studies indicate ß-glucans inhibit HSV-1 adsorption, penetration, and cell-to-cell spread, while also enhancing macrophage proinflammatory cytokine responses.

Resveratrol

Resveratrol (RSV), a stilbene present in various foods, exerts its antiviral effect against HSV by targeting the viral transcriptional machinery. It inhibits ribonucleotide reductase, which reduces the production of essential viral proteins, including ICP-4. This disruption of protein synthesis consequently impairs the activation of viral genes at all stages of replication, a process mediated by RSV's suppression of NF-kB.

Nutraceuticals and supplements with effects on the lens

Diabetic cataracts

In diabetic dogs, elevated glucose causes lens saturation of the hexokinase pathway, triggering aldose reductase (AR) to convert glucose to sorbitol. Sorbitol accumulation leads to osmotic water influx, resulting in lens fibre damage and cataracts. Cataracts develop rapidly in diabetic dogs, often within months of diagnosis. Although topical AR inhibitors like Kinostat have proven effective, they are not currently marketed.

Alpha Lipoic Acid

Alpha-lipoic acid (ALA), derived from caprylic acid, acts as both an antioxidant and aldose reductase inhibitor. Inhibiting Aldose reductase may prevent the excessive accumulation of sorbitol in the lens. Its antioxidant properties include metal chelation, reactive oxygen species scavenging and glutathione regeneration. Research indicates that daily ALA administration (2 mg/kg) in diabetic dogs can impede cataract progression, but not reverse existing changes.

Cataracts and refractive errors

The lens, essential for focusing light on the retina, is inherently susceptible to photo-oxidation. Despite its seemingly inert nature, the lens maintains high ATP levels, indicating active oxidative metabolism crucial for transparency. Continuous light and oxygen exposure generate reactive oxygen species (ROS), accelerating cataract formation through protein oxidation and aggregation. Antioxidants can mitigate this damage by preventing protein and lipid oxidation. Lens sclerosis, a common age-related change in dogs, impairs vision with increased opacity and light scattering, resulting in myopia. This myopic shift can significantly affect canine activities requiring distance vision.

While veterinary literature on antioxidants and the lens is limited, human studies highlight the importance of vitamin C, a potent antioxidant and UV filter, which is naturally abundant in diurnal animal lenses. Xanthophylls like lutein and zeaxanthin are also being investigated for their antioxidant potential, primarily in relation to macular degeneration.

Research indicates that various natural antioxidants, including curcumin, lycopene, and grape-seed extract, can protect against cataracts in experimental models. A six-month study by Wang et al.[5] demonstrated that a specific antioxidant blend (lutein, zeaxanthin, ß-carotene, astaxanthin, vitamins C and E) significantly slowed refractive error progression in dogs, suggesting a potential benefit for canine vision health.

Neuroprotective agents for canine degenerative retinal and optic nerve diseases

Degenerative retinal and optic nerve diseases in dogs, including glaucoma, SARDS, PRA, and retinal detachment, lead to irreversible vision loss. Despite treatments for some conditions, progression often continues due to factors like oxidative stress, excitotoxicity, and inflammation. Neuroprotection, aimed at preserving neuronal function, is therefore a key focus.

While robust clinical data is lacking, veterinary ophthalmologists frequently prescribe neuroprotective therapies. A survey showed 85% use these agents, particularly for glaucoma and PRA. Oxidative stress mitigation is the primary strategy, with Ocu-GLO™ and similar supplements, containing antioxidants like lutein, zeaxanthin, and omega-3 fatty acids, being commonly prescribed.

Lutein and zeaxanthin, oxygenated carotenoids, are potent antioxidants and blue light filters. Their unique properties allow them to effectively quench singlet oxygen in the retina. Human studies suggest xanthophyll supplementation improves central vision. Research indicates that nutritional factors, including lutein and zeaxanthin, may help prevent age-related retinal decline and preserve vision in dogs.

Conclusion

Nutraceuticals show promise in veterinary ophthalmology as safe and effective adjunctive therapies. However, their precise mechanisms across various eye conditions require further investigation.

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Empowering Owners to Keep Osteoarthritic Dogs Moving: A Guide for Veterinary Professionals

Ansi van der Walt
MScPhysio

Introduction

Osteoarthritis (OA) is a lifelong condition that requires a proactive approach to management. Veterinary professionals are trusted sources of evidence-based information, guiding pet owners through the complexities of OA care.

However, failing to address clients' concerns and provide clear, practical guidance can lead to a breakdown in trust. In such cases, owners may seek unreliable advice from online forums or anecdotal sources, which may not align with best veterinary practices.

Building strong client relationships through empathetic communication, education, and collaboration helps owners feel confident in following veterinary treatment recommendations when managing their dog's OA.

By equipping them with simple, daily strategies, veterinary professionals can improve adherence to treatment plans and achieve better long-term outcomes. This article explores practical ways to support owners in maintaining their dog's mobility and comfort.

At the core of effective OA management are two key pillars:

1. Clients should be guided to a deeper understanding of chronic OA pain, how it differs from acute pain, and the crucial role of environmental management in maintaining mobility.
2. An OA management plan should emphasise healthy, consistent low-impact movement combined with effective weight management.

Beyond these foundations, interventions such as pharmacological treatments, physiotherapy, nutritional supplementation, assistive devices, and other complementary therapies provide a dynamic and personalised approach to enhancing joint health and overall patient well-being.

Educating Owners on Chronic OA Pain and Home Management

Unlike acute pain, which serves as an adaptive response to injury, persistent OA pain is maladaptive and fluctuating. Helping owners understand this distinction encourages proactive care rather than reactive treatment during flare-ups.

Client education should begin with environmental adjustments that reduce joint stress and improve comfort. These include:

- Non-slip flooring to prevent falls and minimise joint strain.
- Ramps and steps to reduce the impact of jumping.
- Orthopaedic bedding to alleviate pressure on sore joints.

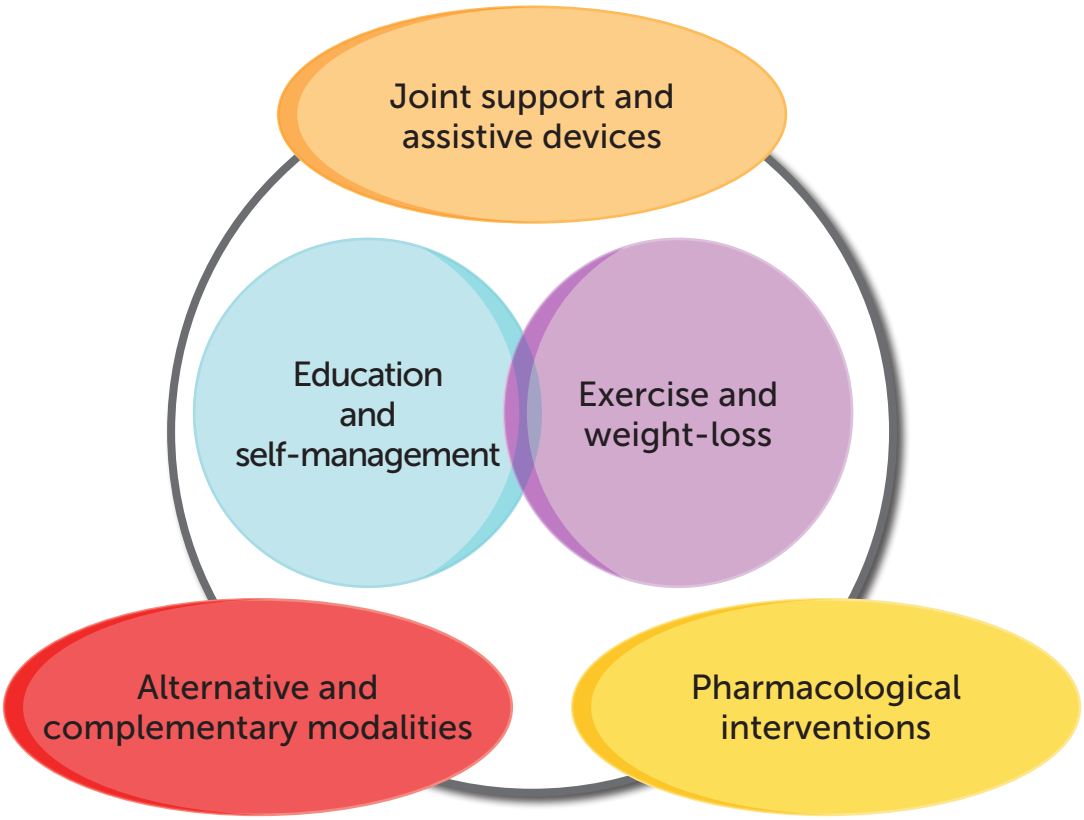

Figure 1. Overton, Chris, Amanda E. Nelson, and Tuhina Neogi. "Osteoarthritis treatment guidelines from six professional societies: similarities and differences." Rheumatic Disease Clinics of North America 48.3 (2022): 637 - 657.

Encouraging small environmental changes can significantly enhance a dog's mobility and quality of life.

A realistic long-term management plan helps owners manage their expectations and leaves them feeling less helpless when faced with their dog's pain. They need to understand that healthier dog that is not suffering the effects of long-term deconditioning is more likely to have effective endogenous pain regulation, reducing central nervous system sensitivity and improving overall well-being. By reinforcing these key messages, veterinarians can help owners take a proactive role in their dog's care.

Key Points to Communicate:

- OA is progressive but manageable with consistent at-home strategies.
- Dogs often mask pain, so subtle behavioural changes must be discussed and taken seriously.
- Chronic pain does not always mean inevitable decline; with proper management, pain can be reduced and mobility maintained.
- A combination of veterinary-led treatments and owner-led home interventions leads to better mobility and quality of life.

Providing clear, accessible resources on recognising and managing OA pain empowers owners to stay engaged in their dog's care.

The Role of Physiotherapy in OA Management

Physiotherapy is a crucial element of osteoarthritis management, providing both immediate and long-term benefits by alleviating pain, improving mobility, and maintaining joint function. A balanced approach that combines in-clinic physiotherapy with owner-led home-based supportive care ensures that interventions remain sustainable and effective in the long run.

The Importance of In-Clinic Physiotherapy

Veterinary physiotherapy encompasses a diverse range of targeted interventions aimed at improving mobility, reducing pain, and enhancing joint function. Physiotherapy treatment approaches may include therapeutic exercise therapy, manual therapy techniques such as joint mobilisation, soft tissue work and technology-assisted therapies such as extracorporeal shockwave therapy, electrical muscle stimulation, and photobiomodulation. These interventions play a role in promoting circulation, reducing inflammation, and supporting tissue healing. Delivered in a clinical setting, physiotherapy allows for controlled progression and professional monitoring, ensuring each patient receives a personalised treatment plan tailored to their specific condition and response to therapy.

Empowering Owners with Home-Based Support

While in-clinic treatments are vital, long-term success depends on owners incorporating healthy movement strategies at home. This is done by ensuring that owners are given the skills

and tools to practice effective home-based management of their dog's OA pain. By balancing professional interventions with effective home care, owners can contribute significantly to their dog's comfort and long-term joint health.

Striking a Balance for Long-Term Success

A collaborative approach, where veterinary physiotherapists provide structured interventions while empowering owners with the skills to implement home care, ensures sustained improvements in mobility and comfort. This model promotes adherence to treatment plans, mitigates the risk of exacerbations (flare-ups), and enhances the overall quality of life for dogs with OA.

By integrating in-clinic physiotherapy with practical home-based strategies, clinicians can create a comprehensive, sustainable approach that optimises outcomes in osteoarthritis management.

"Pacing, Pacing and Pacing!"

Activity pacing involves gradual exercise progression, avoiding overexertion, and incorporating rest periods and helps to prevent pain flare-ups and maintain mobility. The importance of pacing should be emphasised when discussing exercise with owners, and they should be encouraged to monitor their dog's response to activity and learn how to recognise signs of fatigue or discomfort. This ensures they are able to adjust exercise intensity appropriately.

The multidisciplinary veterinary care team should collaborate to set appropriate activity goals for dogs with joint pain, tailoring exercise plans to each dog's needs and reinforcing the balance between movement and recovery. By doing this, veterinary professionals can foster greater commitment from owners, leading to improved outcomes and sustained mobility for dogs with OA.

Talking to Clients about Supplements

Most dog owners will consider supplementation for their dogs with OA pain, so it is important for veterinary professionals to take the lead in discussing them with clients. It is important to provide clear, evidence-based information while setting realistic expectations.

Supplements can play a supportive role in OA management, but they are most effective when combined with a holistic approach, including appropriate pharmacological pain control, physiotherapy, weight management, and consistent low-impact exercise.

Key Points to Address:

- *The Role of Supplements:* Supplements can help support joint health by reducing inflammation, providing building blocks for cartilage, and improving overall comfort. However, they should not be seen as a cure or a standalone treatment.
- *What Supplements Can and Can't Do:* Supplements can contribute to reducing discomfort and enhancing mobility, but their effects are often gradual and may not replace the need for veterinary-prescribed pain relief or structured physiotherapy.
- *Selecting the Right Supplements:* Encourage owners to choose high-quality, veterinarian-recommended supplements backed by scientific research.
- *Consistency is Key:* Like any other aspect of OA management, supplements need to be given consistently over time to be effective. Irregular use is unlikely to yield significant benefits.
- *Avoiding Misinformation:* Help owners navigate the overwhelming supplement market by guiding them toward trusted brands and formulations rather than unverified or fad products.

By fostering open conversations and providing clients with reliable information, veterinary professionals can help owners make informed choices and integrate supplements effectively into their dog's overall OA management plan.

Conclusion

Veterinary professionals can improve osteoarthritis treatment outcomes by educating and empowering owners. Helping them understand chronic pain and develop healthy daily habits allows them to become active participants in their dog's care. Shifting from reactive treatment to proactive management leads to better adherence to veterinary treatment plans and significantly improves long-term outcomes. By providing clear, practical guidance, veterinarians can turn pet owners into engaged partners in their dog's joint health, ensuring a more comfortable, mobile, and fulfilling life for their companions.

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Identifying and Treating Canine and Feline Urolithiasis

Rachel Williams
DVM, DACVS-SA
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Urolithiasis is a common complaint in dogs and cats presented to veterinary emergency, primary care, and specialty services. Although uroliths can appear anywhere along the urinary tract, the bladder is the most common location.[1]

Uroliths can be identified incidentally because of a workup of urinary signs, or a life-threatening urinary obstruction. Prompt diagnosis and intervention are important to maximise the likelihood of a successful outcome.

Diagnosis

Many patients with urolithiasis present for lower urinary tract signs such as haematuria, stranguria, and pollakiuria. In cases of a urinary obstruction, they may present with a history of straining to urinate without production, vomiting, and anorexia. Although diagnostic imaging is the ideal method of diagnosis for urolithiasis, other diagnostics should not be overlooked. Uroliths are broadly categorised as radiolucent or radiopaque, although in clinical practice there is more of a spectrum than a binary classification. Historically, urate crystals and cystine calculi are classified as radiolucent, and other stone types (e.g., calcium oxalate, struvite, silica, and brushite) are classified as radiopaque.

Following confirmation of the presence of cystic calculi, it is essential to perform additional diagnostics to identify any concurrent conditions that may contribute to stone formation and recurrence. Such additional diagnostics include a biochemistry panel to evaluate for hypercalcemia, a known risk factor for calcium oxalate formation, or changes in synthetic liver enzymes that may signal liver pathology or presence of a portosystemic shunt that can drive urate stone formation.

A urinalysis should also be performed to screen for bacteriuria or pyuria as well as to measure pH in the event that alkalinisation or acidification of the urine is necessary following a determination of stone type to minimise the chances of recurrence.

Treatment options

Depending on the size and number of calculi, as well as the size and species of the patient, various treatment options may be available such as voiding urohydropulsion, cystoscopic retrieval, or surgical options such as a cystotomy or percutaneous cystolithotomy. It is important to note that the only stone type amenable to dissolution is struvite.

Cystotomy

A caudal laparotomy is performed, and the bladder is isolated and exteriorised. A stay suture is placed in the bladder apex using 3-0 or 4-0 monofilament, as appropriate. A stab incision is made into the ventral aspect of the bladder, and the incision extended with Metzenbaum scissors.

A bladder spoon may be used to remove the calculi in the bladder. A red rubber catheter of appropriate size should be passed retrograde and used to flush any remnant urethral calculi into the bladder for removal. Surgery should not be considered complete until all residual calculi have been removed via the cystotomy.

A small sample of bladder mucosa should be obtained and submitted for culture. Closure of the bladder may proceed in a simple interrupted or continuous pattern, using a 3-0 or 4-0 monofilament suture. The bladder heals very quickly, reaching normal tissue strength in 14 to 21 days, so a quickly absorbable monofilament such as Monocryl or Biosyn is recommended for closure.

A leak test is at the discretion of the surgeon but is strongly recommended for novice surgeons. This may be done either via the urinary catheter or by injecting sterile saline directly into the bladder with a syringe and needle.

Percutaneous cystolithotomy

Figure 1: Uroliths at the trigone of the bladder as observed using endoscopy.

This is a newer technique used to remove cystic calculi as well as obtain bladder biopsies in a minimally invasive fashion. This technique requires some additional instrumentation such as an Alexis wound retractor, a paediatric cystoscope or flexible ureteroscope, laparoscopic ports, and ideally a stone extraction basket.

The advantages of this technique include fewer long-term stone recurrences, a lower likelihood of incomplete removal of uroliths, and shorter hospitalisation times in addition to the traditional advantages of minimally invasive surgery, such as decreased pain and a quicker recovery.[2-4] For this technique, an approximately 2-cm ventral midline incision is made following placement of a large urinary catheter, and an Alexis wound retractor is placed to provide radial retraction. A stay suture is placed in the apex of the bladder, and then 2 additional stay sutures are placed, forming a triangle. A stab incision is made in the centre of the triangle using an No. 11 blade, and a 5-mm laparoscopic point is inserted into the cystotomy.

At this point, the endoscope can be introduced and fluids connected to the urinary catheter. Calculi will generally accumulate toward the trigone and can be visualised with the endoscope (Figure 1). Small stones can be flushed through the laparoscopic port and collected, but larger ones will need to be manipulated with the stone extractor basket to be removed.

Tips and tricks

One challenging aspect of performing a cystotomy to remove calculi is maintaining visualisation. In conjunction with this, urothelium is a sensitive tissue and quickly becomes oedematous with manipulation. The creative use of stay sutures can facilitate visualisation and decrease frustration with the procedure. When performing a cystotomy, the placement of not only the stay suture at the apex but also one on either side of the cystotomy can aid in visualisation of the trigone and proximal urethra (Figure 2).

An additional challenging element during a cystotomy may be the retrograde placement of a urinary catheter in a female dog or cat. One method to tackle this is to first pass a urinary catheter normograde until it exits the urethra and then suture a second urinary catheter of the same or a smaller size to the first. The original urinary catheter may now be pulled backward, which will facilitate placement of the retrograde urinary catheter. Another method to tackle this problem is the 2-catheter technique for urethral catheterisation described by Dornbusch *et al*.[5] This is a technique in which a large urinary catheter is placed somewhat dorsal to block off the vagina. A second, more appropriately placed urinary catheter is then inserted and is unable to be deflected into the vagina and will thus enter the urethra.

Postoperative management

Following a routine cystotomy, an unobstructed patient is ideally maintained on isotonic crystalloids at a maintenance rate as well as analgesia such as a pure μ-opioid. Methadone (0.1-0.2 mg/kg intravenously every 6 to 8 hours) is a common

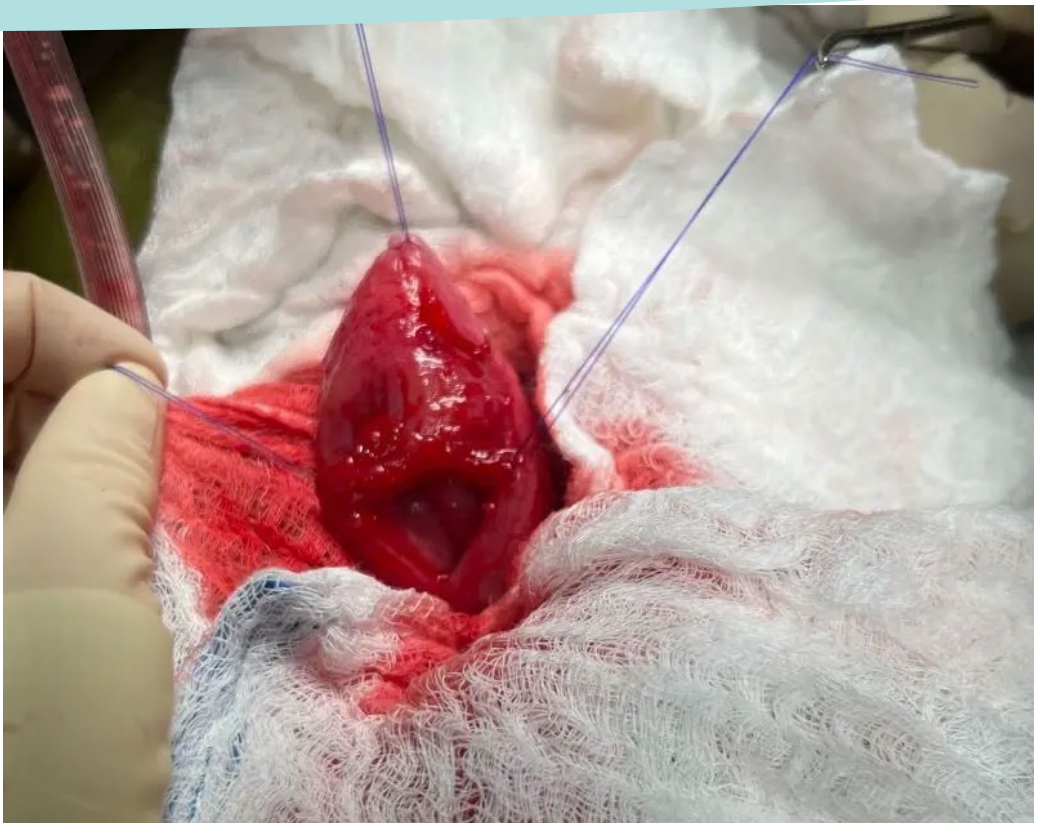

Figure 2: Stay suture placement at the bladder apex to optimise visualisation and manipulation

choice following cystotomy. An indwelling urinary catheter is not necessary in the postoperative period. Most patients can be discharged the following day and are managed on routine oral medications such as gabapentin (10 mg/ kg orally every 8 hours) or codeine (1-2 mg/ kg orally every 8 to 12 hours). Nonsteroidal anti-inflammatory drugs should be avoided if the patient presented with an obstruction, and postoperative blood gases should be monitored in this case to ensure appropriate correction of potential electrolyte derangements and azotaemia.

Readers are directed to more specific texts for management of urinary obstructions. The decision to prescribe postoperative antimicrobials should be made based on preoperative diagnostics and the likelihood of a concurrent urinary tract infection or concern for a break in sterility.

Follow-up

Stones collected should be sent to a reference lab for identification to tailor follow-up care and minimise chances of recurrence. Identification of any comorbidities should also prompt the clinician to recommend treatment and may alter postoperative management of the patient with urolithiasis.

Depending on the type of stone that is identified, follow-up recommendations may include acidifying or alkalinising the urine, castration, dietary changes, or regular diagnostics such as radiographs and urinalyses.

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